



Future climate change driven sea-level rise: Secondary consequences from human displacement for island biodiversity

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Abstract:

Sea-level rise (SLR) due to global warming will result in the loss of many coastal areas. The direct or primary effects due to inundation and erosion from SLR are currently being assessed; however, the indirect or secondary ecological effects, such as changes caused by the displacement of human populations, have not been previously evaluated. We examined the potential ecological consequences of future SLR on >1,200 islands in the Southeast Asian and the Pacific region. Using three SLR scenarios (1, 3, and 6 similar to m elevation, where 1 similar to m approximates most predictions by the end of this century), we assessed the consequences of primary and secondary SLR effects from human displacement on habitat availability and distributions of selected mammal species. We estimate that between 332% of the coastal zone of these islands could be lost from primary effects, and consequently 852 million people would become SLR refugees. Assuming that inundated urban and intensive agricultural areas will be relocated with an equal area of habitat loss in the hinterland, we project that secondary SLR effects can lead to an equal or even higher percent range loss than primary effects for at least 1018% of the sample mammals in a moderate range loss scenario and for 2246% in a maximum range loss scenario. In addition, we found some species to be more vulnerable to secondary than primary effects. Finally, we found high spatial variation in vulnerability: species on islands in Oceania are more vulnerable to primary SLR effects, whereas species on islands in Indo-Malaysia, with potentially 748 million SLR refugees, are more vulnerable to secondary effects. Our findings show that primary and secondary SLR effects can have enormous consequences for human inhabitants and island biodiversity, and that both need to be incorporated into ecological risk assessment, conservation, and regional planning.

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Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Other Climate Scenario

Other Climate Scenario: 1m, 3m, 6m Sea Level Rise (SLR)

Exposure :

weather or climate related pathway by which climate change affects health

Climate Change and Human Health Literature Portal

Ecosystem Changes, Extreme Weather Event, Human Conflict/Displacement, Sea Level Rise

Extreme Weather Event: Flooding

Geographic Feature: 

resource focuses on specific type of geography

Ocean/Coastal, Tropical

Geographic Location: 

resource focuses on specific location

Non-United States

Non-United States: Asia, Australasia

Asian Region/Country: Other Asian Region

Other Asian Region: Southeast Asian islands

Health Impact: 

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Mitigation/Adaptation: 

mitigation or adaptation strategy is a focus of resource

Mitigation

Model/Methodology: 

type of model used or methodology development is a focus of resource

Outcome Change Prediction

Population of Concern: A focus of content

Other Vulnerable Population: People living near coast

Resource Type: 

format or standard characteristic of resource

Research Article

Timescale: 

time period studied

Long-Term (>50 years)

Vulnerability/Impact Assessment: 

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content